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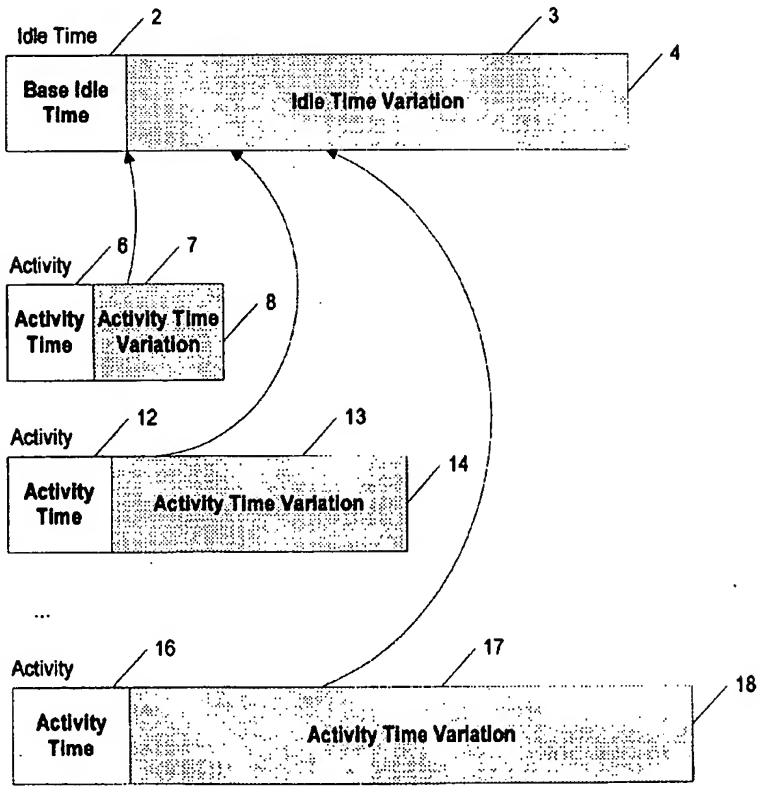

(57) Abstract: Apparatus and method for presenting to a consumer various forms of information during periods where the consumer is idle. A signal indicating the start of idle time (2) is used to trigger the presentation to the consumer of various offers. This is done in a series of interactions between a computer interface and the consumer. The interactions are planned based on previously acquired information about the consumer, the current transaction, the venue of the transaction, the time of day, the date of the transaction, and the estimated time available. The method enables the apparatus to use information about the consumer and the system to select and present activities (6, 12, 16) to the consumer. The accumulated information about the consumer's transactions are analyzed and are used to improve the efficiency of the consumer's interaction with the system in the same or similar venues.

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METHOD AND APPARATUS FOR OPTIMAL FITTING ACTIVITIES INTO CUSTOMER IDLE TIME

FIELD OF THE INVENTION

This invention relates to a method of selecting a set of activities, from a larger possible set of activities, to present to a customer given: the customer's history, a store's history, and the time and day of the customer's activity; such that the maximum value is extracted from the available customer idle time, without exceeding the idle time, in a specified percent of cases. These activities include: viewing ads, selecting coupons, buying products, looking at public service announcements, etc.

BACKGROUND OF THE INVENTION

This invention relates generally to point-of-service computer systems of the type used in multilane retail stores, gas stations and banks to record transactions. Specifically, the invention relates to point-of-service systems that can handle the presentation of visual or audio information to the customer and allow that customer to respond to that information. Point-of-service systems have mechanisms for inputting a code recorded on a credit card, debit card, loyalty card, driver's license and/or acquiring via some other means the identification of a customer being serviced. Such mechanisms include magnetic track readers (commonly called 'stripe readers'), keypads and touch screens.

During the final minutes of a purchase of products in a retail environment, the customer is idle for a period of time (idle time). In a multilane store, (grocery, variety goods, etc.) the customer waits for the checkout clerk to ring up the purchases. In a gas station, the customer waits for the attendant or pump to fill the tank. This is wasted time. In general, neither the customer nor the store benefits from the activities of the customer during this time.

A mechanism for making use of this time can allow the retailer to gain additional revenue and profit. This invention allows these objectives to be met by optimizing the value of the activities presented to the customer.

SUMMARY OF THE INVENTION

The method of the invention involves the use of information about the characteristics of the customer in a specific venue or a similar venue, at a time of day, and date; the use of profiles regarding specific consumers and generic consumers; information about a current retail transaction; and using that information in whole or in part to optimize the customer idle time. An optimization takes into effect the value of a proposed use of the time the customer is idle (idle time) during the checkout or delivery processes, and the desire of the owner of the venue to avoid extending the primary transaction being performed. The primary transaction might be the purchase of groceries, drugs, gas, etc. The value of the activities can be represented in the form of revenue to the presenting retailer, a service company managing the interactions, a target retailer or product manufacturer and the utility to the customer.

A number of means are provided to: identify the customer; identify the venue; identify a start of idle time; present information; to select activities such as ads, coupon offers, product offerings and service offerings; to fit alternative activities to the idle time; evaluate the alternative activities; and to select between the alternative activities based on the value of the alternative dialogs.

The invention performs the steps of: determining a likely speed of the customers response to various presentations, determining the current system response time, determining the probability distribution for the time to compete activities, collecting the value of the possible activities, estimating the probability distribution for the time the customer will be idle at the point-of-service terminal; and selecting the best set and ordering of activities that will fit within the expected idle time, while meeting a criteria on the probability of continuing the activity beyond the expected idle time.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an overview of the problem solved by the invention.

Fig. 2 is a block diagram of a computer system, which is adapted to perform the method of the invention.

Fig. 3 is a block diagram of a computer system called the Point-of-service Terminal.

Fig. 4 is a block diagram of a computer system called the Store Server.

Fig. 5 is a diagram of a tree structure that represents a customer activity.

Fig. 6 is a data table that describes the customer.

Fig. 7 is a data table that describes a Customer Store Profile.

Fig. 8 is a data table that describes Credit, Debit and Loyalty Cards.

Fig. 9 is a data table that describes a Store Definition Table.

Fig. 10 is a data table that describes the Idle Time Message.

Fig. 11 is a Point-of-service Terminal Table.

Fig. 12 is a data table that describes a Store Profile Table.

Fig. 13 is a data table that describes a Customer Session.

Fig. 14 is a list of proposed Activities.

Fig. 15 Is the Activity Table.

Fig. 16 is an Activity Work Table.

Fig. 17 is an activity diagram that describes a Customer Session.

Fig. 18 is an activity diagram that describes usage of Customer Idle Time.

Fig. 19 is an activity diagram that describes a Customer Activity Cycle.

Fig. 20 is an activity diagram that describes Customer Action Cycle.

Fig. 21 is a flow chart for Activity Selection.

Fig. 22 is a flow chart describing Value Packing.

DETAILED DESCRIPTION OF THE INVENTION

The invention is described in terms of a multilane store (that is, a store with multiple checkout counters), but applies to other retail, wholesale and financial institutions.

Fig. 1 describes the characteristics of Idle Time 4 and Activities' 8, 14, and 18 activity time. Idle Time 4 is composed of Base Idle Time 2 and Idle Time Variation 4, which can be represented by a probability distribution giving the probability that Idle Time 4 will complete in a specified time. In like manner, Activities 8, 14, and 18 (instances of Activity 200 described and illustrated below

with reference to Fig. 5) have similar variations and representations. The variations described as items 4, 8, 14 and 18 are shown as having a finite limit, but in practice the tails on these variations can be quite long. The method described is concerned with establishing the probability that an Activity 8, 14 or 18 will complete in Idle Time 4. In the case of Activity 8, the probability is high that it will complete. However, if Activity 8 used the maximum amount of time and the Idle Time 4 had a small Idle Time Variation 3, it would complete after the Idle Time 4 had completed. In the cases of Activity 14 and Activity 18, the probability of completion is successively lower.

Suppose that the activities selected for presentation to the customer are Activity 8, Activity 18 and Activity 14 in that order. If Activity 8 completes prior to the end of the Idle Time 4, then the idle time probability distribution used for Idle Time 4 has to be renormalized to account for the portion used by Activity 8. After renormalization, Activity 18 can be tested to see if the probability it will complete is sufficient. If so, it is presented and the process continues. Otherwise, Activity 14 would be tested in the same manner. In the course of this process, none, all or any combination of the activities could be presented to the customer prior to the end of Idle Time 4.

An important aspect of this invention is the order the Activities 8, 14 and 18 are examined. This is determined by the optimization used. In the case of the embodiment described, it is the time-value of the activities, although many other optimizations are possible. Thus in this example Activity 8 has the highest time-value, Activity 18 the next highest time-value and Activity 14 the lowest. It should be noted that the time-value of an Activity 8, 14, or 18 is dependent on the current state of the system presenting Activity 200 as described below with reference to Fig. 5, and the customer to whom Activity 200 is presented, as these will have varying effects on the time it takes to present Activity 200.

Fig. 2 is a block diagram of a network of computers adapted to perform the method of the invention. A Central Server 20 is coupled by a wide area network (WAN) 22 to one or more Store Servers 24. Readily available software and protocols such a TCP/IP are used by Central Server 20 and Store Server 24 to

communicate with each other via WAN 22. Store Server 24 is connected via Local Area Network (LAN) 26 to one or more Point-of-service Terminal 28. Normal Point-of-service Terminal activities are conducted between the Store Server 24 and Point-of-service Terminal 28. These activities are well documented elsewhere and the details are not important to this invention. Store Server 24 selects activities to be presented via Point-of-service Terminal 28 and receives responses from Point-of-service Terminal 28 as the customer interacts with the activities. Central Server 20 acts as a consolidation point for gathering the information from multiple Store Servers 24.

The arrangement of the system and the distribution of function, as described in this embodiment, are one of many possible alternatives.

Fig. 3 illustrates further details of Point-of-service Terminal 28. Point-of-service Terminal 28 performs the functions of presenting information to the customer and receiving the response to that presentation. The configuration shown is representative of Point-of-service Terminal 28, but does not include all possible input and output devices. Microprocessor 40 is a conventional microprocessor with a Bus 38 that connects it to Processor Memory 32. Microprocessor 40 contains a Clock 42 that provides time in a form that includes the Month, Day-of-week, Hour, Minute. Processor Memory 32 contains Application 34 that performs the following functions: presentation of Activities 200, collection of responses from the customer during the presentation of an Activity 200. This information is stored as Application Data 36 into Processor Memory 32 and is transferred to and from Store Server 24 via LAN 26 as needed. Input Device 30 is normally a keypad or touch screen, but could be any other form of input device such as an audio response unit. Input Device 30 is used to collect responses from the customer. It is attached to Microprocessor 40 via attachment 50, which is commonly a standard interface like the RS-232 standard. Display Screen 52 is a visual output device such as a Cathode Ray Tube (CRT), a flat panel liquid crystal display (LCD) or similar device. Other types of output devices, such as audio output units, can be used for this function. Display Screen 52 presents Activities 200 to the customer or other users of the system. It is attached to Microprocessor 40 by Attachment 48.

Magnetic Stripe Reader 54 is an input device attached to Microprocessor 40 via Attachment 50. It is used to collect customer information from credit, debit, loyalty and other ID cards having a magnetic stripe.

The function of Point-of-service Terminal 28 could be performed by PC, client and server machines having additional capabilities. This includes being package with the Store Server 24 or Central Server 20. Point-of-service Terminal 28 responds to the control messages from the Store Server 24, and does not require long-term storage of Application Data 36, but can take advantage of nonvolatile storage when it is present.

Fig. 4, Store Server 24 is a representation of a typical Store Server 24 and can be configured with the appropriate Applications 76 in Program Memory 74 and structures in Data Memory 94 to perform Store Server 24 function. Fig. 4 is shown configured as a Store Server 24. Store Server 24 functions can be packaged in numerous ways, including in a single server, in a plurality of servers, or integrated with Central Server 20 functions.

Store Server 24 performs the functions required in a Point-of-service system that are in support of Point-of-service Terminal 28 in a location. CPU 70 is a conventional microprocessor with a Bus 114 that connects it to Disk Drive(s) 90, a LAN Adapter 92, a WAN Adapter 112, a Program Memory 74 and a Data Memory 94. CPU 70 contains a Clock 72 that provides time in a form that includes the Month, Day-of-week, Hour, Minute, Seconds and fractions of Seconds.

This Data Memory 94 typically contains the following: Customer Table 220 (see Fig. 6), Customer Store Profile Table 250 (see Fig. 7), Credit Debit Loyalty Card Table 330 (see Fig. 8), Store Definition Table 340 (see Fig. 9), Idle Time Message 360 (see Fig 10), Point-of-service Terminal Table 500 (see Fig. 11), Store Profile Table 510 (see Fig. 12), Customer Session Table 600 (see Fig. 13), Activity Table 700 (see Fig. 14), Proposed Activity List 800 (see Fig. 15) and Store Configuration Table 910 (see Fig. 16).

Application 78 acquires information from Central Server 20 via WAN Adapter 112 and WAN 22 to build data structures in Data Memory 94 and to

update Disk Drive(s) 90. It then uses that information to communicate with Point-of-service Terminal 28 vial Local Area Network Adapter 92 and LAN 26, entering into a dialog with a customer presenting Customer Activities 200 to the customer and receiving responses. Customer Activities 200 are selected from Activity Table 700 based on the identification or non-identification of the customer. This is done using Credit, Debit and Loyalty Card Table 330 and Customer Table 220 to convert the external customer identifier into a Customer ID 336 and subsequently using it to access either Customer Store Profile Table 250 (identified customer) or Store Profile Table 510 (non-identified customer) respectively. Once the profile is selected, its information is used, in conjunction with Store Definition Table 340's Idle Time Fit criteria 348 to select Customer Activity 200 from Activity Table 700. These are then presented to the customer using Point-of-service Terminal 28.

Fig. 5 is a diagram of a structure that represents a Customer Activity 200. Customer Activity 200 is composed of a number of screen presentations. The presentations start with a Screen 201 having Screen ID 202. Associated with Screen 201 is a list of Screen ID's 204, 206 and 208 that are individually associated with a Selection ID 203, 205, and 207. The selections are activated by input devices composing the Point-of-service Terminal 28 as specified by the various Selection IDs. In this case, Screen ID 1 204 maps to Screen 210, Screen ID 2 206 to Screen 212, and Screen ID 2 208 to Screen 214. Each Customer Dialog Block 202 is a table with a list of the allowable Selection ID's (in this case: 203, 205, and 207) and Screen IDs (in this case: 204, 206 and 208), of the screen that is to be displayed if that selection is made. Screens 201, 210, 212, 214 etc. are chained together using the various Screen IDs. As the Screen ID is used for the linkage, any meshed structure of Customer Activity Blocks is possible. A Selection ID indicates a response by the customer to the Screen displayed. The response may indicate the customer's acceptance of an offer, rejection of an offer, the desire to page forward or backward in the dialog, or other meaning consistent with content of the dialog being presented. The details of such dialog management are well understood by anyone skilled in the state of the art. Customer Activity

200 dialogs can be constructed to any length by replicating the structure in Screen 201 and chaining each subsequent layer of the structure to a previous layer.

DATA TABLE FORMATS

Fig. 6 illustrates Customer Table 220 that contains a Customer ID 222 which is the ID provided to the retailer by the customer in the course of the primary transaction being performed. It may be a credit card number or other ID, or no ID (anonymous ID). It also contains Date of Creation 224, and Date of Profile Update 226. This table is used by Store Server 24 Application 76 to control the currency of the various profiles.

Fig. 7 is the Customer Store Profile 250 contains the information needed by Store Server 24 to interact with an identified customer. Such customers have used the same identification a sufficient number of times to merit the Central Server 20's generation of a Customer Store Profile Table 250. Customer Store Profile Table 250 is transferred by Central Server 20 to the Store Server 24 via WAN 22 and Wide Area Network Adapter 112 where it is stored in Data Memory 94 and Disk Drive(s) 90. It is composed of the following fields: Customer ID 252 that corresponds to Customer ID 222 and is the internal identification used in the system for identified customers. Store ID 254 is a unique identification for each store participating in the system. Think Time Distribution Parameters 256 are the parameters for the probability distribution that fits the prior experiences with the customer. These describe the variability of the customer's Think Time 1042 (see Fig. 20). The probability distribution used is determined by the Idle Time Distribution Type 506 (see Fig. 11). Agility Coefficient 258 describes the quickness of the customer in using the system.

The following fields are repeated for each day-part of each day of the week. Idle Time Distribution Parameters 266 are the parameters for the probability distribution used to describe Idle Time 1010 (see Fig. 17). In this embodiment, the gamma distribution is used. Its parameters are alpha and beta, which are used in Fig. 22, Value Packing to calculate the probability that a Customer Activity 200 will complete prior to the end of the Idle Time 1010. 1st most likely Activity

ID/Activity Type 270 and Probability of Completion of 1st most likely Activity ID/Activity Type 272 describe either the Activity ID 702 or the Activity Type 704 that has the highest probability to be completed in this period. 2nd most likely Activity ID/Activity Type 274 and Probability of Completion of 2nd most likely Activity ID/Activity Type 276, and 3rd most likely Activity ID/Activity Type 278 and Probability of Completion of 3rd most likely Activity ID/Activity Type 280 behave in the same manner. It should be noted that this list could be of any length. These parameters are used in Fig. 22, block 2008 to build Proposed Activity List 800.

An instance of Customer Store Profile Table 250 can be used for characterizing groups of customers based on similar behaviors. These behaviors include Think Time Distribution Parameters 256, Agility Coefficient 258, and 1st, 2nd, & 3rd most likely Activity ID/Activity Type 270, 274, 278.

Fig. 8 is the Credit, Debit and Loyalty Card Table 330. The table associates Card ID 332 with a Customer Name 334 and Customer ID 336, which is assigned by Store Server 24 when the customer is initially added to the system.

Fig. 9 is the Store Definition Table 340. The table contains a Store ID 342 which uniquely identifies the store; Store Type 343 which is used, optionally, to build Customer Store Profile Tables 250 that span instances of the same Store Type 343 or to build Store Profile Tables that span instances of the same Store Type 343, Idle Time Fit Criteria 344 which specifies the acceptable probability of overrunning the Idle Time 1010. Store Definition Table 340 is built by Central Server 20 as stores are entered into the system.

Fig. 10 is the Idle Time Message 360. These signals are messages generated by Store Server 24 when it detects the start or stop of Idle Time 1010. Two pieces of information are required in a Fig. 10, Idle Time Message. Message ID 362 specifies whether the signal is a 'Start of Idle Time' or an 'End of Idle Time'. Point-of-service Terminal ID 364 associates that signal with a specific checkout counter. This is then associated to a specific customer via Customer Session Table's 600 Point-of-service Terminal 602 field (see Fig. 13).

Fig. 11 is Point-of-service Terminal Table 500, which associates a Screen ID 504 with a Point-of-service Terminal ID 502. That screen is presented at End of Session 1016 at Point-of-service Terminal 28 specified by Point-of-service Terminal ID 502. Idle Time Distribution Type 506 specifies the probability distribution that is to be used for activity at a specific Point-of-service Terminal 28. Idle Time Distribution Type 506, with Idle Time Distribution Parameters 226 or 532 constitute the complete definition of the probability distribution for the current instance of Idle Time 1010.

Fig. 12 is Store Profile Table 510. It is supplied from Central Server 20 as part of a periodic download process. Store ID 512 is a unique identifier assigned by Central Server 20 when the store is added to the system. Point-of-service Terminal ID 514 identifies Point-of-service Terminal 28 in the store for that specific profile. For example, the Express Checkout Lane in a store would have a different Store Profile Table 510 entry than the normal Checkout Lanes. Customer Type 516 is an identifier for a group of customers having similar characteristics that merit a unique profile. The customer information used to develop the Store Profile Table 510 are developed from the customer experience from the store profiled or from venues that are similar to said store. Think Time Distribution Parameter 520 is the parameters for the probability distribution that fits the prior experiences with the anonymous customers. These describe the variability of the customers' Think Time 1042 (see Fig. 20). The probability distribution used is determined by the Idle Time Distribution Type 506. Agility Coefficient 524 describes the quickness of the average customer in using the system.

The following fields are repeated for each day-part of each day of the week. Idle Time Distribution Parameters 532 are the parameters for the probability distribution used to describe Idle Time 1010. In this embodiment, the gamma distribution is used. Its parameters are alpha and beta, which are used in Fig. 22, Value Packing to calculate the probability that a Customer Activity 200 will complete prior to the end of the Idle Time 1010. 1st most likely Activity ID/Activity Type 538 and Probability of Completion of 1st most likely Activity ID/Activity Type 540 describe either the Activity ID 702 or the Activity Type 704

(see Fig. 14) that has the highest probability to be completed in this period. 2nd most likely Activity ID/Activity Type 542 and Probability of Completion of 2nd most likely Activity ID/Activity Type 544, and 3rd most likely Activity ID/Activity Type 546 and Probability of Completion of 3rd most likely Activity ID/Activity Type 548 behave in the same manner. It should be noted that this list could be of any length. These parameters are used in Fig. 22, block 2008 to build Proposed Activity List 800.

Fig. 13 is the Customer Session Table 600. Customer Session 1000 (see Fig. 17) is recorded in the Customer Session Table 600, at the point the customer is identified during Checkout Idle Time 1010. Customer Session Table 600 contains: Point-of-service Terminal 602, which identifies the checkout counter, gas pump, or other terminal used by the customer; Session Number 604, which is assigned by Store Server 24, and is assigned when the customer is identified; and Customer ID 606, which is provided by the customer, generally by passing an identification card Magnetic Stripe Reader 28, or is identified as an anonymous customer, if no identification is used. Customer Store Profile Table 250 is located by using Customer ID 606 to find the entry, and the time from Store Server 24's internal Clock 72 is used to locate the Customer Store Profile Table 250's Day-of-week 262 and Day-part 264, which are to be used. In a similar manner, the anonymous customer is processed using the Store Profile Table 510.

Fig. 14 is the Activity Table 700 that has all the activities offered in the store. These activities are describe in the form of outputs to the customer in the form of screen, video, and audio presentations; and inputs in the form of touchscreen, key pad, voice, card readers and other devices at the point of sale. An Activity 200 is a dialog composed of said inputs and outputs that is presenting ads, information messages, coupon offers, offers to buy, etc. to the customer. It contains: Activity ID 702 which uniquely identifies the activity; Activity Type 704, which specifies the general characteristics of the activity, Activity Value 706, which specifies the economic value of the activity; Activity Time Distribution Type 708, which specifies the type of probability distribution used to describe the

activity; and Activity Time Distribution Parameters, which complete a normalized description of the time to complete the activity.

Fig. 15 is Proposed Activity List 800, which are the candidate activities to be presented to a customer. Proposed Activity List 800's entries are copied from Activity Table 700, after being selected using the Customer Store Profile Table 250 or Store Profile Table 510 indicated by the Customer ID 606. Other Customer Activities 200 may be added to this list because of other criteria, such as an advertiser contracting to have an ad presented to every customer.

Activity Time Distribution Parameters 710 is adjusted as in Fig. 22, and placed in Adjusted Activity Time Distribution Parameters 812. Time-Value 814 is calculated by finding the mean of the distribution specified by Adjusted Activity Time Distribution Parameters 812 and dividing it into Activity Value 808.

Proposed Activity List 800 is built in Fig. 22 and block 2008 and used in Fig. 21 as part of the activity selection process. In the process of building the list, Activity Time Distribution Parameters 710 are adjusted using System Response Time 916 and either Think Time Distribution Parameters 256 or Think Time Distribution Parameters 520, depending on whether the customer has be identified or is anonymous.

Fig. 16 is the Store Configuration Table 910, which is composed of Store ID 912 and Next Session Number 914. Next Session Number 914 is initialized with the value of zero. It is incremented by one each time a Session Number 604 in the Fig. 13, Customer Session Table 600 is assigned. When the field overflows, it is reset to zero. The field size is picked such that Session Numbers 914 assigned in one 24-hour period are unique. System Response Time 916 is calculated dynamically as shown in Fig. 16, System Response Time Calculation. Percent on Time Completion 918 is the overrun criteria for the store. The Store Configuration Table 910 is built by Store Server 24 at system bring up. This table is in Store Server 24 and has one entry for the store.

ACTIVITY DIAGRAMS

Fig. 17, Customer Session 1000, is a diagram that describes a typical Customer Session in a supermarket. Customer Session 1000 will be explained in the context of a grocery store, but is applicable, with minor variations, to most Point-of-service venues. This diagram illustrates the normal flow of a customer in a store. The first customer activity is to Shop 1002. When the shopping list has been filled, the customer enters a Wait for Checkout 1004. Eventually the customer reaches the point where he/she can Unload Shopping Cart 1006 and after having done so will Wait for Checker 1008. Once the checker is available and starts to process the order, the customer enters Checkout Idle Time 1010. When all the items have been rung up, the customer is asked to Make Payment 1012. After this is completed, the customer proceeds to vacate the checkout counter at End of Session 1014.

Fig. 18 is a diagram that describes how the Idle Time 1010 is used. The system presents a series of Customer Activities 200 (Activity 1, Activity 2 through Activity n. These activities are selected based on the time available, the time required to present the activity and the value of the activity. The selection of the Customer Activities 200 is described in Fig. 21 and Fig. 22.

Fig. 19 is a diagram that describes the Activity Cycle 1030. The Fig. 19, Activity Cycle is composed of one or more Action Cycles 1040 (see Fig. 20). These Actions 1040 involve the presentation of a Screen 201 with a set of selections that constitute the customer's response to the screen. Activity Cycle 1030 starts with the 'Start of Idle Time' in the Fig. 10, Idle Time Message and ends with the 'End of Idle Time' in the related Fig. 10, Idle Time Message.

Fig. 20 is a diagram that describes Action Cycle 1040. The Action Cycle 1040 is viewed from the customer's perspective in that it starts with a screen displayed on the Display Screen 52. The customer reads and thinks about the information presented during Think Time 1042. Once a decision is made, the customer responds during Enter Response 1044. The system evaluates the response that is in the form of a Selection ID, and then at the end of System Response Time 1046 it presents Action Alternatives 1048 in the form of next

screen to the customer. The customer makes a choice by selecting a Selection ID associated with the next Screen ID in the Customer Activity 200. This cycle repeats for each Action 1032 in the Customer Activity 200.

FLOW CHARTS

Fig. 21 is a flow chart for Activity Selection, which starts at block 1900. Block 1900 calculates the Idle Time Probability Distribution for the remainder of the Idle Time 1010, by accessing the Idle Time Distribution Parameters 270 or 532, for an identified customer or non-identified customer, respectively, and the Idle Time Distribution Type 506 from Point-of-service Terminal Table 500.

Block 1902 accesses Activity Time Distribution Type 710, and Adjusted Activity Time Distribution Parameters 712 from Proposed Activity List 800. Then it access System Response Time 916 from Store Configuration Table 910 and either Think Time Distribution Parameters 256 (identified customer) or 520 (anonymous customer). These are used to produce an adjusted activity time distribution for the Customer Activity 200. Then it passes control to block 1904.

Block 1904 uses the scaled idle time distribution from block 1900 and the adjusted activity time distribution from block 1902 and calculates the probability that the Customer Activity 200 will complete prior to the end of Idle Time 1010. This can be done by using integral calculus. Then it passes control to block 1906.

Block 1906 compares the probability produced in block 1904 with the Idle Time Fit Criteria 344. If it is greater than or equal to the criteria control passes to block 1914, otherwise control passes to block 1908

Block 1908 sets up to access the next Customer Activity 200 in the Proposed Activity List 800 by deleting the top Customer Activity 200 in the Proposed Activity List 800 and then passes control to block 1910.

Block 1910 checks Proposed Activity List 800, for a Customer Activity 200. If so control passes to block 1902, otherwise control passes to block 1916.

Block 1912 sets up the return and indicates the selected Customer Activity 200. It then returns to the process that called Activity Selection.

Block 1916 sets up the return and indicates that no activity met the criteria, and returns to the process that called Activity Selection.

Fig. 22 is a flow chart describing Value Packing. It starts with block 2002, which determines if the customer is anonymous, or not. If anonymous, control passes to block 2004, which accesses the Customer Store Profile Table 250. Otherwise, control passes to block 2006, which accesses the Store Profile Table 510. In either case, control then passes to block 2008.

Block 2008 accesses the Idle Time Distribution Parameters 256 (identified customer) or 532 (anonymous customer). It then builds the Proposed Activity List 800 from the activity information Customer Store Profile Table 250 (identified customer) or Store Profile Table 510 (anonymous customer), and the Activity Table 700 (see Fig. 13). Additional Customer Activities 200 can be added to the list based on other criteria. Time-Value 814 is calculated as specified in Fig. 15. The Time-Value 814 can be calculated by dividing the Activity Value 706 by the mean of the adjusted activity time probability distribution, which, optionally, can be multiplied by the Probability of Completion 272, 276, 280, 540, 544, and 548. The Proposed Activity List 800 is then sorted into descending sequence on Time-Value 814. Control then passes to block 2010.

Block 2010 calls Activity Selection (Fig. 21) using Proposed Activity List 800 as a parameter of the call. Upon return from Activity Selection (Fig. 21), control passes to block 2012.

Block 2012 determines if an activity was selected. If so control passes to block 2014, otherwise the process is ended.

Block 2014 presents the selected Customer Activity 200 to the customer and if the selected Customer Activity 200 cannot be repeated, it is deleted from the Proposed Activity List 800. Control then passes to block 2016.

Block 2016 checks to see if Idle Time 1010 has ended. If so the processing of the customer ends, otherwise control passes to block 2010.

TYPICAL HARDWARE AND SOFTWARE INFRASTRUCTURE

This invention is based on conventional point-of-service systems. Many manufacturers supply point-of-service equipment, and the invention is not limited to any particular manufacture's equipment. The invention can be implemented using IBM's 3680 Programmable Store System. The Store Server 24 being an IBM 3650 and the Point-of-service Terminal 28 being IBM 3683s.

IBM supplies software (IBM programmable store system MICRCODE) used in controlling operations in the hardware described and a program product (Subsystem Program Preparation Support II (SPPS II)) for writing server and terminal programs. SPPS II includes languages, macroinstructions and a terminal display language. Communication between the terminals and the store server is done by using a LAN 26 and a program written in IBM 3650 Programmable Store System Microcode. Other application programs that form the infrastructure for the invention are SDM (Store Data Management) and HCP (Host Communication Program), both sold by IBM.

The following examples illustrate how the system typically operates.

When an anonymous customer uses the system, the system notes that by the absence of an identification. Typically the customer is paying by cash or check and has not used a loyalty card to initiate the session. The session starts with the customer making a selection from the initial screen presented. This might be the customer indicating that he or she is going to pay in cash. At that time, the system accesses the profile for the anonymous customer. This is called the store profile table. This profile has been built from the activities of the customers in this store or similar stores. The profile contains the expected idle time probability distribution and the parameters necessary to calculate a specific instance of an idle time probability distribution for use during the session. Other parameters in the profile are used in conjunction with the candidate activities' activity time distribution type, and activity time distribution parameters to produce an activity time probability distribution for all instances of the candidate activities. As each activity time probability distribution is produced, it is evaluated for the expected idle time for that activity.

Say an activity presented an advertisement to the customer without any action expected on the part of the customer. In this case, the activity would be presented for a fixed period of time. The activity profile would indicate it was a point probability distribution with a mean of 1. The system would know the standard time that ads are presented, say 15 seconds, and the estimated activity time would be 15 seconds. A second activity presents an opportunity to request a coupon for a product. Its profile indicates a gamma probability distribution with parameter alpha = 4 and beta = 0.75. The anonymous profile indicates that the agility coefficient is 3, indicating a moderately fast customer. The coefficient would be multiplied by the beta parameter of the gamma probability distribution 3*(0.75) giving a beta of 2.25. The beta is then adjusted based on the current system response time. The system response time is converted into a multiplier based on a well know non-linear mapping. If the system response time were 0.1 seconds the multiplier would be 1.0; if it were 1.5 second the multiplier would be 3.6. Once the multiplier is determined the prior beta value would be multiplied by it to produce the expected activity time's gamma probability distribution, and its expected mean would be calculated.

A third activity presents a opportunity to purchase a product and requires a number of interactions to configure the product. Use as an example a cup of coffee. The customer would be presented the offer, select the: brand of coffee, the size of the cup, how much cream, and how much sugar; and then signal the final purchase. This could take up to six screens and 6 customer selections. In this case expected activity time would be the same as the previous example but the gamma probability distribution would have much higher values due to the longer time such an activity would take.

Then each activity would have its time-value calculated by multiplying the activity value by the probability of completion of that activity (from the anonymous profile), and dividing that product by the expected activity time. This computation produces a figure of merit for the activity. The highest value figure of merit is selected as the first candidate activity.

The candidate activity's probability distribution and the idle time probability distribution would be evaluated to calculate the probability that the activity would complete within the idle time. If this probability met the percent on time completion criteria, the activity would be scheduled. Otherwise, activities would be evaluated in descending order based on the figure of merit until an activity was scheduled or the candidate list is exhausted. In this example, we will assume that at least one activity is scheduled.

After the previous activity is completed, the system adjusts the idle time distribution based on the actual time that all the previous activity(ies) consumed. Then the candidate evaluation process in the prior paragraph is repeated, starting with the next activity in the candidate list.

If no activity can be found that meets the percent on time completion criteria, the process of presenting activities is stopped.

The case of the identified customer is similar to the above. The difference is customer store profile is used instead of the anonymous profile. Because the profile is for a specific customer or a very limited set of customers (say husband and wife with the same credit card number), the profile has much more accurate profile information which will increase the value of the activities presented, reduce the probability of exceeding the percent on time completion criteria, and increasing the probability that an activity will be completed by the customer.

It should be understood that the foregoing description is only illustrative of the invention. Various alternatives and modifications can be devised by those skilled in the art without departing from the invention. Examples would be the distribution of this function across multiple computers, the use of input and output devices not specifically mentioned in this document, and the use of activities not described herein. Accordingly, the present invention is intended to embrace all such alternatives, modifications and variances, which fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A system for fitting activities presented to a user during idle time of a primary transaction of a user, in response to the identification or non-identification of said user, in a manner that makes maximal use of said idle time, the system comprising:

at least one terminal located at the venue of said primary transaction, including means for presenting activities to said user and for receiving responses from said user;

a venue server with which said terminal can communicate, said venue server having a user database describing characteristics of said user, and an activity database describing said activities available for presentation to said user;

said database having a user identification means, and user profile means;

said activity database having means to identify and define said activities for presentation to said user and a means to establish the time to completion of said activity;

means to associate said user with one or more said activities;

means for estimating an expected user idle time;

means for selecting and ordering one or more of said associated activities as presentation dialogues such that an estimated time for all of said presentation dialogues probably does not exceed said expected user idle time.

2. A system as in claim 1, where said means for selecting and ordering one or more of said associated activities, further includes means for use of an overrun probability criteria.

3. A system as in claim 1, where said means for selecting and ordering one or more of said associated activities, further includes means for use of system response time.

4. A system as in claim 1, where said user profile means, further includes means for providing profiles for groups of said users having similar characteristics, and said means to associate said user with one or more activities is further extended, to make use of said groups of said users having similar characteristics as a means to select said activities.

5. A system as in claim 4, where said groups of said users having similar characteristics, are drawn from the same venue.

6. A system as in claim 1, where said user profile means, further includes means for users agility characterization, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said user agility characterization, to minimize the probability said estimated time for all of said presentation dialogues does not exceed said expected user idle time.

7. A system as in claim 1, where said user profile means, further includes means for users think time characterization, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said user think time characterization, to minimize the probability said estimated time for all of said presentation dialogues does not exceed said expected user idle time.

8. A system as in claim 1, where said user profile means, further includes means for users think time characterization, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said user think time characterization, to minimize the

probability said estimated time for all of said presentation dialogues does not exceed said expected user idle time.

9. A system as in claim 8, where said user profile means, further includes means for characterization the probability that said user will select the preferred outcome of said activity, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said characterization the probability that said user will select the preferred outcome of said activity to order the sequence in which said activities are selected.

10. A system as in claim 1, where said user profile means, further includes means for users activity type preference characterization, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said users activity type preference characterization to order the sequence in which said activities are selected.

11. A system as in claim 10, where said user profile means, further includes means for characterization the probability that said user will select the preferred outcome of said activity, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said characterization the probability that said user will select the preferred outcome of said activity to order the sequence in which said activities are selected.

12. A system for optimizing the value of activities presented to a user during idle time of a primary transaction of a user, in response to the identification or non-identification of said user, the system comprising:

at least one terminal located at the venue of said primary transaction, including means for presenting activities to said user and for receiving responses from said user;

a venue server with which said terminal can communicate, said venue server having a user database describing characteristics of said user, and an activity database describing said activities available for presentation to said user;

said database having a user identification means, and user profile means;

said activity database having means to identify and define said activities for presentation to said user and a means to establish the value of completing said activity;

means to associate said user with one or more said activities;

means for selecting and ordering one or more of said associated activities as presentation dialogues such that the total value of said presentation dialog is maximized.

13. A system as in claim 12, where said means for selecting and ordering one or more of said associated activities, further includes means for use of a time-value criteria.

14. A system as in claim 12, where said user profile means, further includes means for providing profiles for groups of said users having similar characteristics, and said means to associate said user with one or more activities is further extended, to make use of said groups of said users having similar characteristics as a means to select said activities.

15. A system as in claim 14, where said groups of said users having similar characteristics, are drawn from the same venue.

16. A system as in claim 12, where said user profile means, further includes means for users agility characterization, and said means for selecting and ordering

one or more of said associated activities as presentation dialogues is further extended to use said user agility characterization to improve the estimate that said activity time can be completed in said expected user idle time.

17. A system as in claim 12, where said user profile means, further includes means for users think time characterization, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said user think time characterization to improve the estimate that said activity time can be completed in said expected user idle time.

18. A system as in claim 12, where said user profile means, further includes means for users activity preference characterization, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said users activity preference characterization to order the sequence in which said activities are selected.

19. A system as in claim 18, where said user profile means, further includes means for characterization the probability that said user will select the preferred outcome of said activity, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said characterization the probability that said user will select the preferred outcome of said activity, to order the sequence in which said activities are selected.

20. A system as in claim 12, where said user profile means, further includes means for users activity type preference characterization, and said means for selecting and ordering one or more of said associated activities as presentation dialogues is further extended to use said users activity type preference characterization to order the sequence in which said activities are selected.

21. A system as in claim 20, where said user profile means, further includes means for characterization the probability that said user will select the preferred outcome of said activity, and said means for selecting and ordering one or more of

said associated activities as presentation dialogues is further extended to use said characterization the probability that said user will select the preferred outcome of said activity to order the sequence in which said activities are selected.

22. A system for optimizing the number of activities presented to a user during a bounded period of time, in response to the identification or non-identification of said user, the system comprising:

at least one terminal used by said user, including means for presenting activities to said user and for receiving responses from said user;

a venue server with which said terminal can communicate, said venue server having an activity database describing said activities available for presentation to said user;

said activity database having means to identify and define said activities for presentation to said user and a means to establish the time to complete said activity, said means using knowledge of said users think time characteristic;

means to associate said user with one or more said activities;

means for selecting and ordering one or more of said associated activities as presentation dialogues such that an estimated time for all of said presentation dialogue probably does not exceed said bounded period of time.

23. A system for optimizing the number of activities presented to a user during a bounded period of time, in response to the identification or non-identification of said user, the system comprising:

at least one terminal used by said user, including means for presenting activities to said user and for receiving responses from said user;

a venue server with which said terminal can communicate, said venue server having an activity database describing said activities available for presentation to said user;

said activity database having means to identify and define said activities for presentation to said user and a means to establish the time to complete said activity, said means using knowledge of said users agility in using said system;

means to associate said user with one or more said activities;

means for selecting and ordering one or more of said associated activities as presentation dialogues such that an estimated time for all of said presentation dialogue probably does not exceed said bounded period of time.

24. A system as in claim 23, in which said means to establish the time to complete said activity, further includes means to use knowledge of said users agility in using said system.

25. A system as in claim 23, in which said means to establish the time to complete said activity, further includes means to use knowledge of said users think time characteristic.

26. A system for optimizing the number of activities presented to a user during a bounded period of time, in response to the identification or non-identification of said user, the system comprising:

at least one terminal used by said user, including means for presenting activities to said user and for receiving responses from said user;

a venue server with which said terminal can communicate, said venue server having an activity database describing said activities available for presentation to said user;

said activity database having means to identify and define said activities for presentation to said user and a means to establish the time to complete said activity, said means using knowledge of said systems current response time;

means to associate said user with one or more said activities;

means for selecting and ordering one or more of said associated activities as presentation dialogues such that an estimated time for all of said presentation dialogue probably does not exceed said bounded period of time.

27. A system as in claim 26, in which said means to establish the time to complete said activity, further includes means to use knowledge of said users agility in using said system.

28. A system as in claim 26, in which said means to establish the time to complete said activity, further includes means to use knowledge of said users think time characteristic.

29. A method of optimizing the use of the idle time of a user to undertake activities at a point of service terminal comprising the steps of:

determining a likely speed of the users response to various presentations of activities,

determining the current system response time,

determining the probability distribution for the time to compete activities,

collecting the value of the possible activities,

estimating the probability distribution for the time the user will be idle at the point-of-service terminal; and

selecting the best set and ordering of activities that will fit within the expected idle time, while meeting a criteria on the probability of continuing the activity beyond the expected idle time.

30. The method of claim 29 including the step of providing profiles for groups of said users having similar characteristics, and said selecting step includes associating said user with one or more activities using said user profiles.

31. The method of claim 30 wherein said step of providing profiles for groups of said users draws said groups of users from the same venue.

32. The method of claim 29 including the step of determining the identity of the user and the profile of said user and said selecting step includes associating said user with one or more activities using said user profile.

33. The method of claim 32 wherein the profile of said user including the characteristics of the user selected from the group consisting of the agility of the user in using the point of service terminal and the think time of the user in using the point of service terminal and wherein said selecting step incorporates one or more of said determined characteristics of the user.

34. The method of claim 29 including determining the characteristics of the user selected from the group consisting of the agility of the user in using the point of service terminal and the think time of the user in using the point of service terminal and wherein said selecting step incorporates one or more of said determined characteristics of the user.

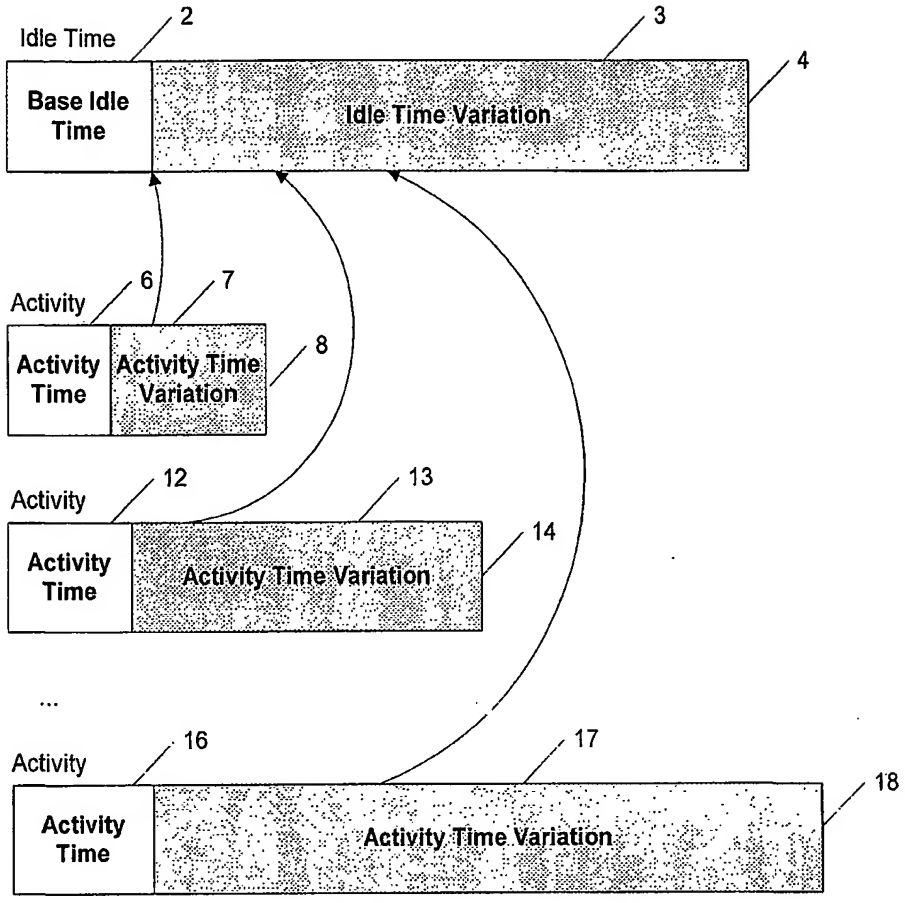
Idle Time
2
3
4
Base Idle Time
Idle Time Variation
Activity
6
7
Activity Time
Activity Time Variation
8
Activity
12
13
14
Activity Time
Activity Time Variation
...
Activity
16
17
18
Activity Time
Activity Time Variation

Fig. 1

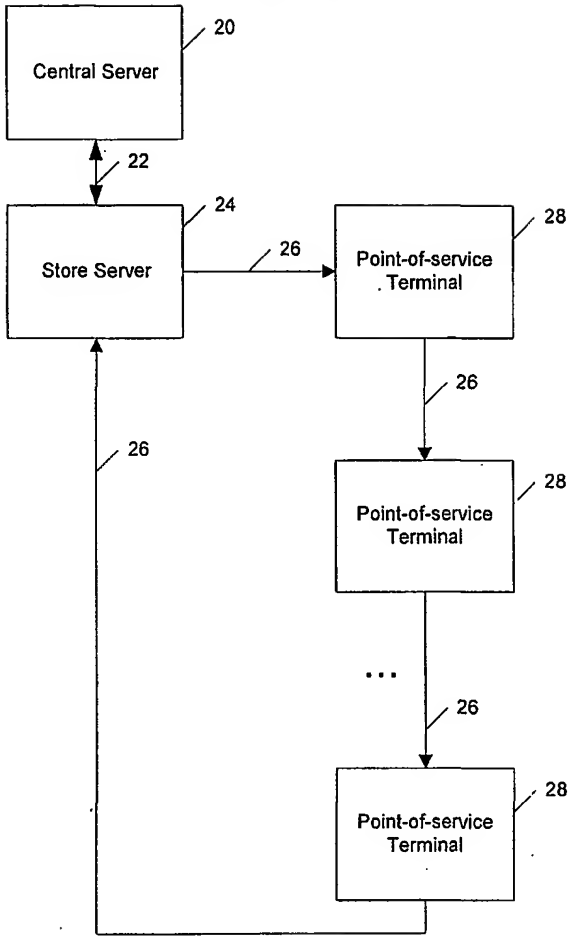
Central Server
20
22
Store Server
24
26
Point-of-service Terminal
28
26
26
Point-of-service Terminal
28
...
26
Point-of-service Terminal
28

Fig. 2.

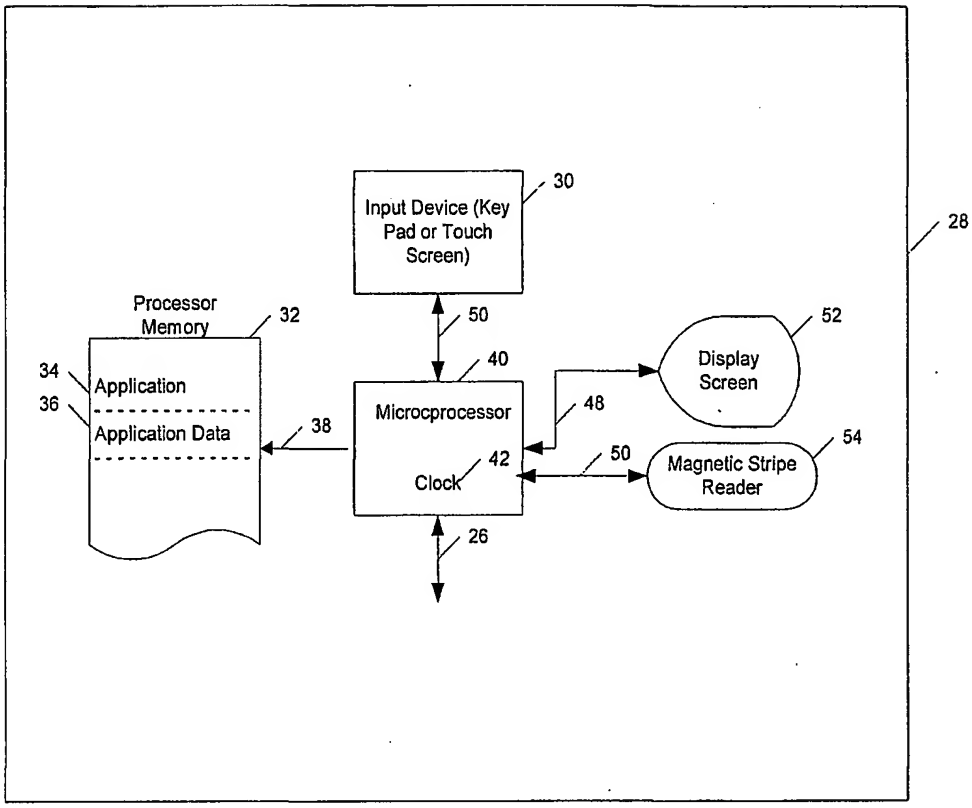
Input Device (Key Pad or Touch Screen)
30
28
Processor Memory
32
50
52
Display Screen
34
Application
40
36
Application Data
38
Microcprocessor
48
42
Clock
50
Magnetic Stripe Reader
54
26

Fig. 3

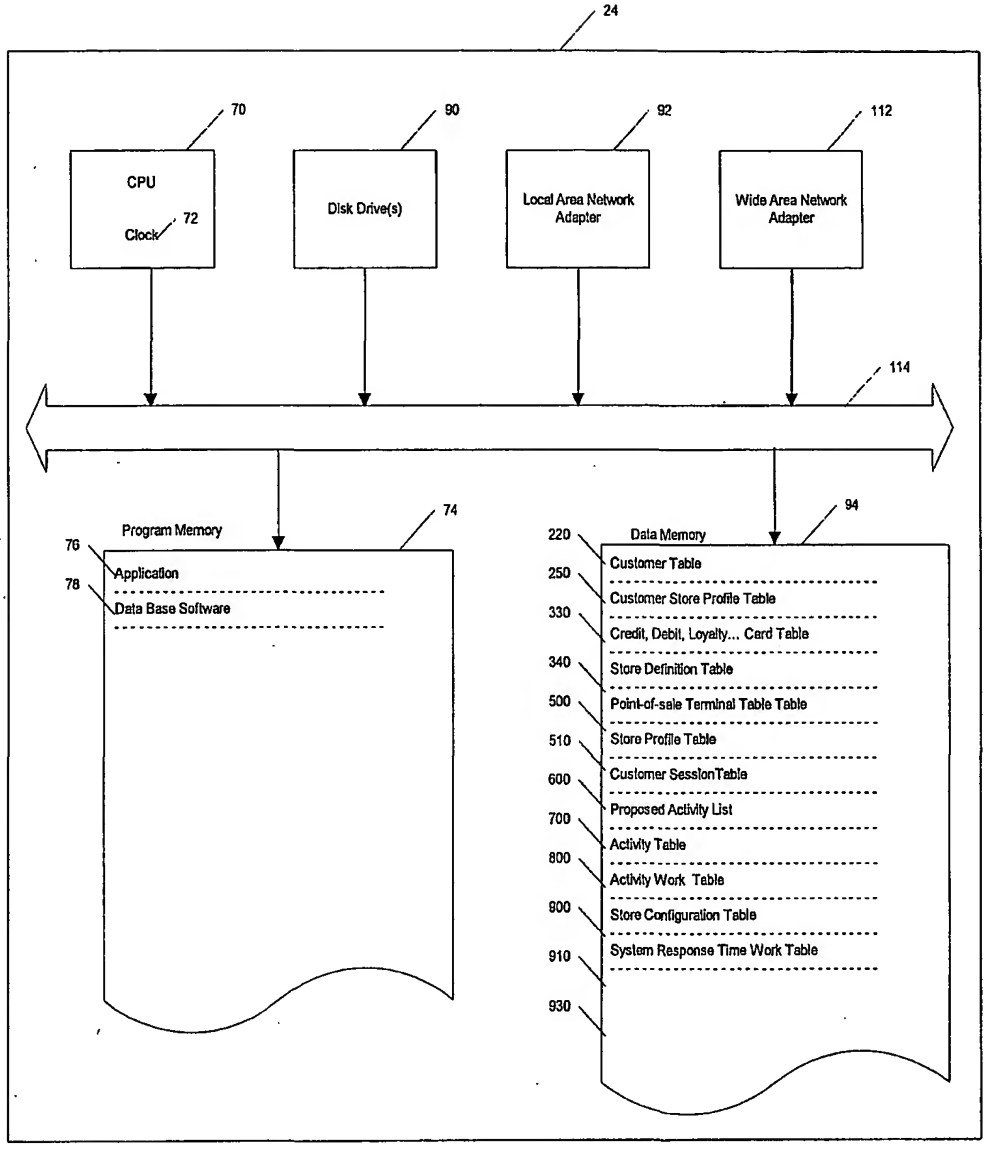
24
70
CPU
Clock
72
90
Disk Drive(s)
92
Local Area Network Adapter
112
Wide Area Network Adapter
114
74
Program Memory
76
Application
78
Data Base Software
94
Data Memory
220
Customer Table
250
Customer Store Profile Table
330
Credit, Debit, Loyalty... Card Table
340
Store Definition Table
500
Point-of-sale Terminal Table Table
510
Store Profile Table
600
CustomerSessionTable
700
Proposed Activity List
800
Activity Table
900
Activity Work Table
910
Store Configuration Table
930
System Response Time Work Table

Fig. 4

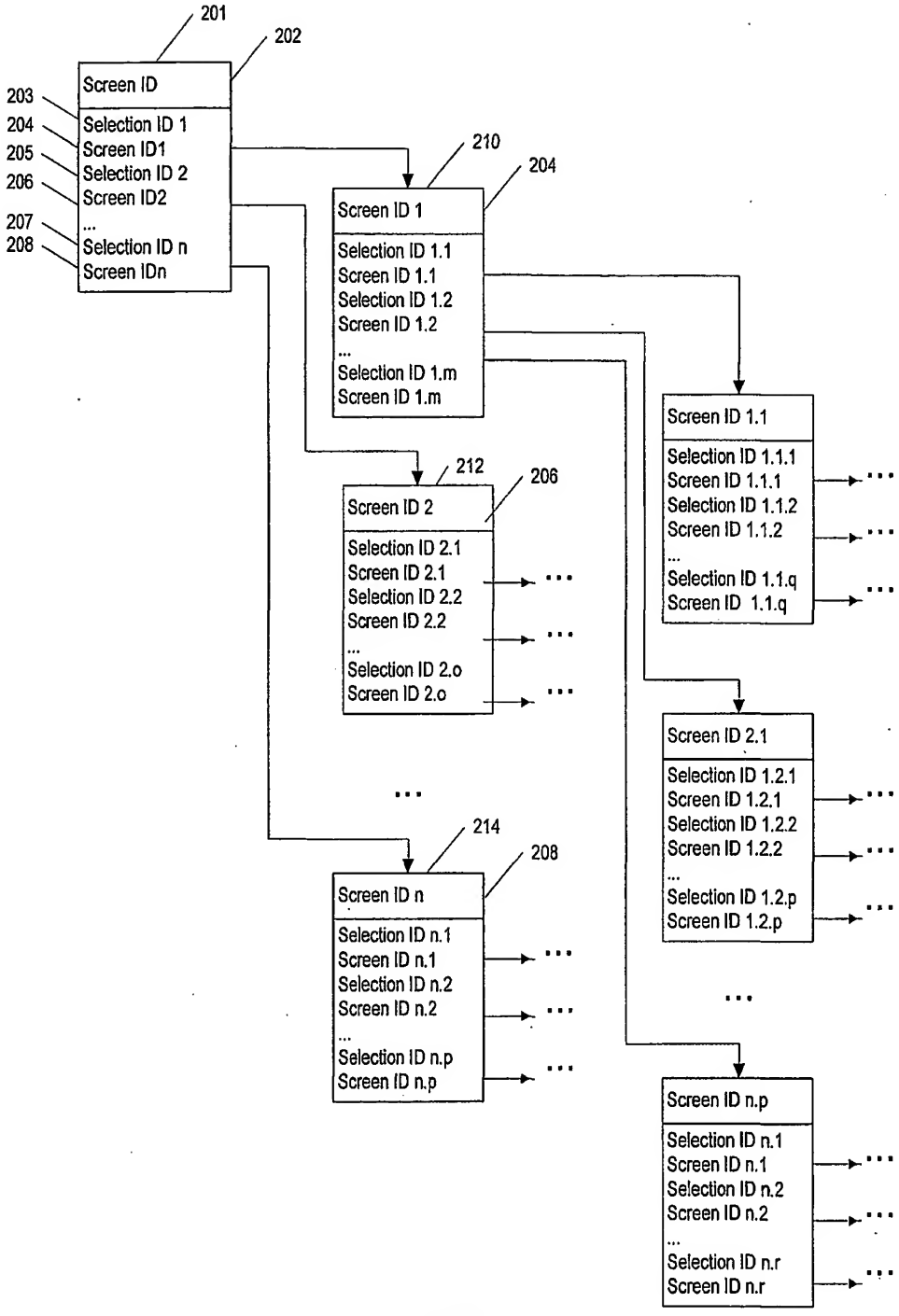
201
202
Screen ID
203
204
205
206
207
208
Selection ID 1
Screen ID1
Selection ID 2
Screen ID2
...
Selection ID n
Screen IDn
210
204
Screen ID 1
Selection ID 1.1
Screen ID 1.1
Selection ID 1.2
Screen ID 1.2
...
Selection ID 1.m
Screen ID 1.m
212
206
Screen ID 2
Selection ID 2.1
Screen ID 2.1
Selection ID 2.2
Screen ID 2.2
...
Selection ID 2.o
Screen ID 2.o
214
208
Screen ID n
Selection ID n.1
Screen ID n.1
Selection ID n.2
Screen ID n.2
...
Selection ID n.p
Screen ID n.p
Screen ID 1.1
Selection ID 1.1.1
Screen ID 1.1.1
Selection ID 1.1.2
Screen ID 1.1.2
...
Selection ID 1.1.q
Screen ID 1.1.q
Screen ID 2.1
Selection ID 1.2.1
Screen ID 1.2.1
Selection ID 1.2.2
Screen ID 1.2.2
...
Selection ID 1.2.p
Screen ID 1.2.p
Screen ID n.p
Selection ID n.1
Screen ID n.1
Selection ID n.2
Screen ID n.2
...
Selection ID n.r
Screen ID n.r

Fig. 5

Field Name	Rows in Data Table				ID #
Customer ID			...		222
Date of Creation			...		224
Date of Profile Update			...		226

Fig. 6

Field Name	Rows in Data Table				ID #
Customer ID			...		252
Store ID			...		254
Think Time Distribution Parameters			...		256
Agility Coefficient			...		258
Repeat below Day-of-week			...		262
Repeat for Day-part			...		264
Idle Time Distribution Parameters			...		266
1st most likely Activity ID/Activity Type			...		270
Probability of Completion of 1st most likely Activity ID/Activity Type			...		272
2nd most likely Activity ID/Activity Type			...		274
Probability of Completion of 2nd most likely Activity ID/Activity Type			...		276
3rd most likely Activity ID/Activity Type			...		278
Probability of Completion of 3rd most likely Activity ID/Activity Type			...		280
End Day-part			...		282
End Day-of-week Repeat			...		284

Fig. 7

Field Name	Rows in Data Table				ID #
Card ID			...		332
Customer Name			...		334
Customer ID			...		336

Fig. 8

Field Name	Rows in Data Table				ID #
Store ID			...		342
Store Type			...		343
Idle Time Fit Criteria			...		344

Fig. 9

Field Name	Rows in Data Table				ID #
Message Type (Idle Time)			...		361
Message ID (Start of Idle Time or End of Idle Time)			...		362
Point-of-service Terminal ID			...		364

Fig. 10

Field Name	Rows in Data Table				ID #
Point-of-service Terminal ID			...		502
Point-of-service Terminal Type (Standard, Express...)			...		503
Screen ID			...		504
Idle Time Distribution Type			...		506

Fig. 11

Field Name	Rows in Data Table				ID #
Store ID			...		512
Point-of-service Terminal ID			...		514
Customer Type			...		516
Think Time Distribution Parameters			...		520
Number of Think Time Samples			...		522
Agility Coefficient			...		524
Repeat below for Day-of-week			...		528
Repeat for Day-part			...		530
Idle Time Distribution Parameters			...		532
1st most likely Activity ID/Activity Type			...		538
Probability of Completion of 1st most likely Activity ID/Activity Type			...		540
2nd most likely Activity ID/Activity Type			...		542
Probability of Completion of 2nd most likely Activity ID/Activity Type			...		544
3rd most likely Activity ID			...		546
Probability of Completion of 3rd most likely Activity ID/Activity Type			...		548
End Day-part Repeat			...		550
End Day-of-week Repeat			...		554

Fig. 12

Field Name	Rows in Data Table				ID #
Point-of-service Terminal ID			...		602
Session Number			...		604
Customer ID			...		606

Fig. 13

Field Name	Rows in Data Table				ID #
Activity ID			...		702
Activity Type			...		704
Activity Value			...		706
Activity Time Distribution Type			...		708
Activity Time Distribution Parameters			...		710

Fig. 14

Field Name	Rows in Data Table				ID #
Activity ID			...		802
Activity Type			...		804
Activity Value			...		808
Activity Time Distribution Type			...		810
Adjusted Activity Time Distribution Parameters			...		812
Time-Value			...		814

Fig. 15

Field Name	Rows in Data Table				ID #
Store ID			...		912
Next Session Number			...		914
System Response Time			...		916
Percent On Time Completion			...		918

Fig. 16

Field Name	Shop	Wait For Check-out	Unload Shopping Cart	Wait for Checker	Idle Time	Make Pay-ment	End Of Session
ID #	1002	1004	1006	1008	1010	1012	1014

Fig. 17

Field Name	Activity 1	Activity 2	...	Activity n
ID #	200	200	200	200

Fig. 18

Field Name	Action 1	Action 2	...	Action n
ID #	1032	1032	1032	1032

Fig. 19

Field Name	Think Time	Enter Response	System Response Time	Present Action Alternatives
ID #	1042	1044	1046	1048

Fig. 20

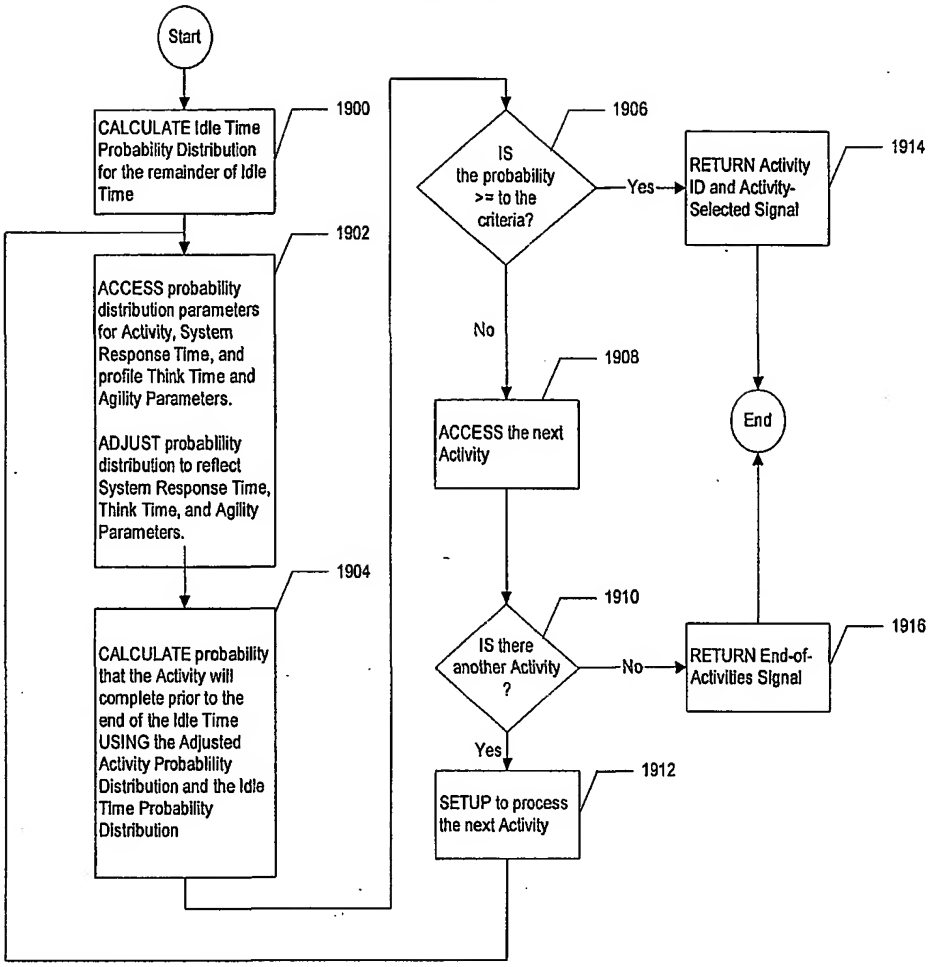
Start
CALCULATE Idle Time Probability Distribution for the remainder of Idle Time
1900
ACCESS probability distribution parameters for Activity, System Response Time, and profile Think Time and Agility Parameters.
ADJUST probability distribution to reflect System Response Time, Think Time, and Agility Parameters.
1902
CALCULATE probability that the Activity will complete prior to the end of the Idle Time USING the Adjusted Activity Probability Distribution and the Idle Time Probability Distribution
1904
IS the probability >= to the criteria?
1906
Yes
RETURN Activity ID and Activity-Selected Signal
1914
No
ACCESS the next Activity
1908
IS there another Activity ?
1910
No
RETURN End-of-Activities Signal
1916
Yes
SETUP to process the next Activity
1912
End

Fig. 21

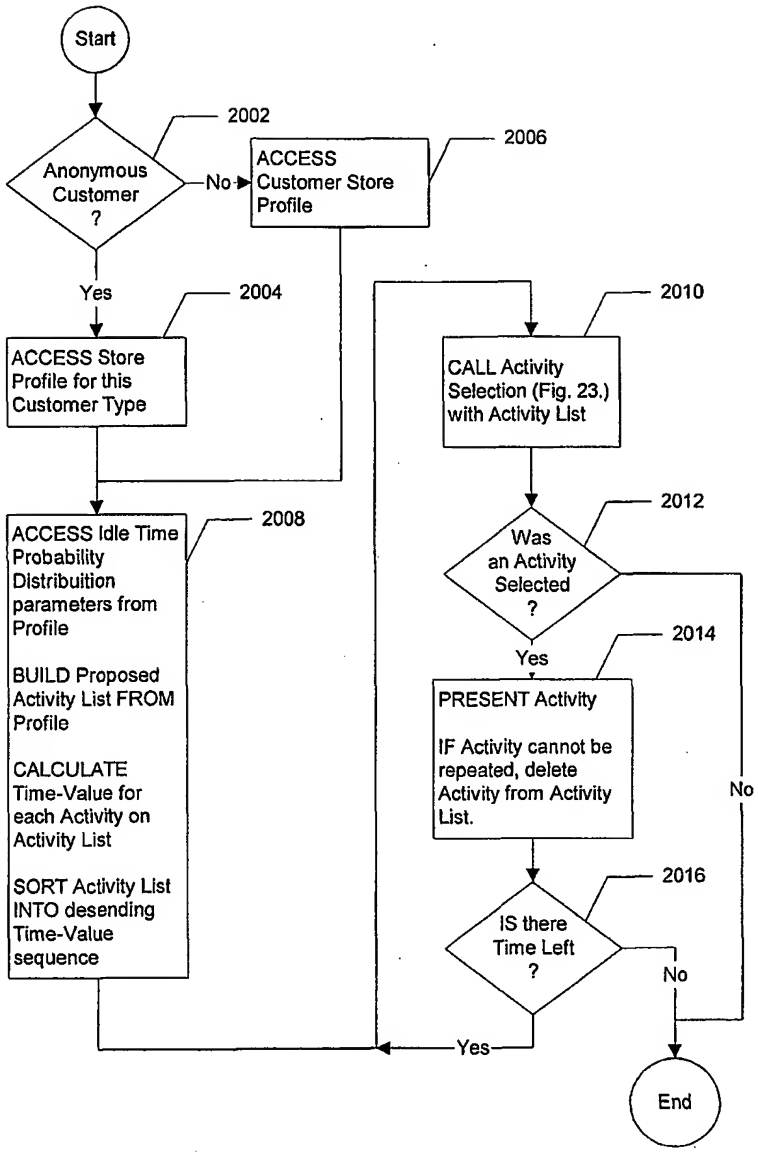
Start
2002
Anonymous Customer ?
No
2006
ACCESS Customer Store Profile
Yes
2004
ACCESS Store Profile for this Customer Type
2010
CALL Activity Selection (Fig. 23.) with Activity List
2012
Was an Activity Selected ?
2008
ACCESS Idle Time Probability Distribuition parameters from Profile
BUILD Proposed Activity List FROM Profile
CALCULATE Time-Value for each Activity on Activity List
SORT Activity List INTO desending Time-Value sequence
Yes
2014
PRESENT Activity
IF Activity cannot be repeated, delete Activity from Activity List.
No
2016
IS there Time Left ?
No
Yes
End

Fig. 22

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/41171

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G06F 15/173
US CL :709/224

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 709/224

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

None

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Plus search

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,883,819 A (ABU-AMARA et al) 16 March 1999, see abstract, and backgroung/summary.	1-34
A	US 5,623,404 A (COLLINS et al) 22 April 1997, see entire document.	1-34

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 16 SEPTEMBER 2001	Date of mailing of the international search report 18 OCT 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer Peggy Harwood ARIO ETIENNE Telephone No. (703) 308-7562

Form PCT/ISA/210 (second sheet) (July 1998) ★